

**SMT Magazine Column:
Jumping Off The Bandwagon**

**Toward a New Organizational
Model: Replacing Insanity with
Logic, Cost Effectiveness and
Customer Service**

For the December 2016 Edition

In the beginning there was through-hole technology (Pin-in-Hole: PIH). Then, someone said, “let there be SMT,” and, the earth and firmament creaked and groaned as Atlas shrugged.

In 1980, Mount St. Helens in Washington erupted – an ominous harbinger prior to the mass arrival of the new technology. Like the kid’s swinging banjo from atop the bridge in the beginning of the film, *Deliverance* – the two canoes passing under: “Stop, stop. Go back, go back.” But, no! Man – I mean, “mankind” (I wear my PC – *politically correct*, not *printed circuit* badge – with pride) will take on and conquer nature. And, we all know how that turned out: “Aintry? This river don’t go to Aintry.”

It was as if the volcano cried out in Nature’s language, “Stop, stop!” as it belched and spewed a profusion of greenhouse gases. The dark foreboding this event created was an omen for more cataclysmic events to come. Seven years later there was an earthquake in Whittier, California, near Los Angeles.

Two years later in 1989 the Loma Prieta temblor struck the San Francisco Bay area, the epicenter near, you guessed it, the SMT epicenter of San Jose. The World Series at Candlestick Park was interrupted as Mother Nature continued her protest. Say it ain’t so, Joe – as the earth rebuked man’s (I mean, “huMANity’s” – I’m a sensitive guy,

you know) attempt to make things smaller yet.

The “Tower of Babel,” you say –
just child’s play.
“Pride proceedeth the fall,” you warn. Ha!
We laugh at your scorn.
It’s futile to try, so jump on our bus
because as you can see
there is nothing that will stop us!

“Smaller, Smaller, I say,” as Moore (Gordon, not Clement) became our patron saint.

Those of us that were there at the creation asked, “This is good?”

But, it was. We went to sleep and when we awoke all was right with the world. Why, without it there would be no Pokemon GO™, no portable social media, no ability to tell you in real time what I just had for lunch.

Probably more significant are the medical breakthroughs in monitoring and pharmaceutical delivery systems, endoscopic operating procedures, wearable electronics, “ingestible” electronics – nanobots in our bloodstream, and other electronic devices and systems that will improve the human condition.

The dangers are just as provocative – the incredible processing speeds we have available to operate on the big data that is being accumulated with every credit card purchase we make, putting personal privacy at risk: Technology meet the Constitution! Also, using genetic engineering to create creatures that would frighten Dr. Frankenstein’s monster, and the ability to use robotics as a destructive force. These are just a few.

Kevin McCarthy don't fret
go to sleep, then awaken with a nod
your Luddite fears will have disappeared
as you emerge from your pod –
like those of high wire aerialists:
Mario & Luigi,
who discover below them a net.

For you youngsters I want you to understand that SMT technology really doesn't go back to biblical times, and it wasn't brought to earth by ancient alien astronauts.

However, I do remember back in the beginning, after the wheels of change (excuse the mixed metaphor) were put in motion with a gust of wind. A large computer company got the attention of component suppliers by asking, out of the blue, for quotes on millions of these “new” surface mountable electrical component packages.

The Four Things That Haven't Changed Since the Advent of SMT

Nearly everything in the electronic product design and production business has changed since that fateful time. I can really only think of four things that haven't:

1. The laws of physics
2. The laws of economics
3. The basic way we educate for our industry
4. The way we structure our design and production companies

The first one we don't have much control over. Personally, I've tried to levitate, but can't seem to advance past the flutter stage.

The second one pertains to all businesses: e.g., the value of a product or a service is based on what a customer is willing to pay for it (supply and demand), the ability to make a profit (cost management), etc.

The third one I've studied, analyzed, talked and written about. A new educational strategy to better serve the high tech electronic design and assembly industry has been initiated. It will co-locate a college with a for-profit EMS provider. The EMS will provide the student with a real world classroom for a four-year undergraduate program that will lead to a B.S. in Applied Electronic Product Design and Manufacturing Sciences.

That leaves number four.

Ironically, it is firmly linked to number three. How? An alternate production organizational model has not been available to us because graduates interested in design, manufacturing and assembly have been educated in our traditional educational framework – the “Ivory Tower” of academia, not the real world.

In other words, the skills needed for any alternative “lean” or “flattened” organizational model can only be taught in the real world – soft skills such as working in self-managed teams, conflict resolution, aligning constituencies, and the art of rhetoric and persuasion as they apply to team dynamics. In past columns we focused on the technical skill gap between academic preparation and industry need. However, the ability to reduce labor cost by organizational reform requires a real world classroom, as well.

Before volume manufacturing and assembly opened on the global stage, it didn't much matter. The severe international competitive pressure wasn't there. Production labor rate competition was “locally” based. Protectionist tariff policies as well as concerns about low labor rate production skills and quality were used

to resist these sources of low labor rate cost.

Having addressed reducing raw direct labor cost in past columns and papers through reducing labor *content* through automation and increasing yields by a drastic reduction in rework (1), we turn to the controllable cost contributor presented by indirect, overhead and general and administrative costs as a function of organizational structure.

Our Company

Let's look at the economic impact of a new organizational model by defining our mythical high tech EMS company: *Chips and DIPs*.

One way to classify the size of our company is by its annual sales (2):

- Tier 1: greater than \$2.0 billion
- Tier 2: between \$500 million and \$2.0 billion
- Tier 3: greater than \$100 million and less than \$500 million
- Tier 4: greater than \$30 million and less than \$100 million
- Tier 5: less than \$30 million

Material accounts for about \$24 million or 80% of sales. That leaves \$16 million in direct labor, burden (indirect labor, overhead, G&A and profit).

Our company, C&D, is a Tier 4 EMS provider with annual sales of about \$75 million USD. It is a low volume, high mix product portfolio. We have on the average six OPD customers at any time.

One of the things that has made contract manufacturing so attractive to a product developer is cost. Most OPDs (Original Product Developers) have come to the conclusion that it is their best interest to off

load the production of their products to a contract manufacturer (EMS). This way they are able to defray the capital and labor costs they would incur if they chose to do their own assembly.

Everything else being equal this is largely untrue. However, in many cases it becomes the right decision for the wrong reasons. The logic used is similar to the decision an ODP makes to produce their products remotely, using a source with low labor rates – also, generally wrong (3). But, I digress – we'll save these subjects for future columns.

The EMS industry is incredibly competitive. I liken it to a supermarket: the store's margins are very, very slim. The store makes very little when it sells one can of peas, so to make a reasonable total profit it has to sell lots of cans of peas.

C&D's Organizational Model

As a business unit we at C&D had the choice of several standard hierarchal organizational models to choose from. All of them collected personnel with common and similar skill sets into departments. Each department has a manager. Some departments have group leaders and section heads. We have directors who "lead" groups of departments or have an area of specialized skill and responsibility. Finally, at the apex of the pyramid we have a Chief Executive Officer (CEO), the head of the "fish." See November's SMT Magazine column (4)

We want to give our customer the feeling that their products get personal attention. So, we form product teams by matrixing in personnel from different departments to form a program team. Each member of the team still reports to, and is reviewed by their department manager, but has specific program responsibilities as well. The

program manager had dotted line supervisory authority over the team member.

The Labor Skills We Need at C&D

This is a partial list of the job skills and tasks that we had to fill and fit into our organization chart for both direct and indirect labor:

- Production planners
- Industrial engineers
- Automation engineers
- Electrical test engineers
- Personnel to load customer bills of material into MRP
- Procurement people to generate material quotes for sales & marketing
- Master scheduler and planners who plan and release work orders to production
- Program managers
- Material handlers (in-shipping, material inspectors, pack and ship)
- Inventory and stock room personnel
- Process engineers who develop assembly processes and generate ops sheets
- Kitting people who pull and kit material for released work orders
- People who deliver the kits to the appropriate equipment and work stations
- People who program stencil printers
- People who set up the stencil printers
- People who operate the stencil printers
- People who program the component placement equipment
- People to load tape and reel feeders and set up component placement equipment
- Component placement equipment operators
- Process people to develop reflow oven profiles
- Slide line operators
- Single station build operators

- Engineer or technician to develop and program the wave solder machine
- Wave solder machine operator
- Board cleaning operators
- Cleanliness testing personnel
- In-process inspectors
- Test engineers to develop ICT and functional tests
- Personnel to conduct the testing
- Engineers and technicians to troubleshoot failed circuit boards and products
- Technicians who troubleshoot the automated equipment and process when it is producing defects
- People who perform maintenance and repair on the production equipment
- Sales and Marketing people
- Finance people
- Supervisors and managers for procurement, production, process engineering, test engineering, and quality assurance, finance, marketing, sales
- Human resources
- Factory safety officer
- Office and manufacturing cleaning personnel
- IT people to maintain and upgrade computer equipment

Whew!

Other Costs

In addition to the salaries and hourly wages for each of the employees used to meet the task requirements described above, the following costs and benefits for each employee must be absorbed in the labor selling rate:

- Medical insurance
- Unemployment compensation tax
- Worker compensation insurance
- Social Security tax
- Medicare taxes
- Holiday pay

- Vacation pay
- Sick pay
- Pension or retirement plan contributions
- Training costs

Fixed overhead costs include:

- Building costs
- Utilities: Power, natural gas, water, and sewer for the facility
- Computer and communication systems for the facility
- Spare parts for the operations and facilities
- Depreciation on the automated assembly equipment and the remaining facility capital equipment
- Insurance and property taxes on the assembly equipment and facilities
- Safety and environmental costs

Next month we'll group all the personnel into an org. chart and assign individual labor costs. Then, look at an alternate organizational structure – one that permits a more efficient and cost effective way to manage electronic product assembly.

Hey, what do YOU say? I'd like to hear your thoughts and experiences.

(1) T. Borkes – “Like Holding the Wolf by the Ears...’ – The Key to Regaining Electronic Production Market Share: Breaking Free of the Division of Labor Manufacturing Model in High labor Cost Global Regions,” SMTA International Conference Proceedings, Orlando, Florida, August 2008

(2) T. Borkes; P. McDonough – The Economical Development of a Lead-Free Assembly Process: A Practical Case Study That Minimized Conversion and Operational Costs, SMTA International Conference Proceedings, Orlando, Florida, October 2007, Pg. 1

(3) T. Borkes – “Paper or Plastic? Choosing to Move Offshore,” SMT Magazine, April 2006

(4) T. Borkes – “Leadership in your Company: Something to Worry About?” SMT Magazine, November 2016, Pg. 71